

SEQUENCE LISTING

<110> ROZEN, Rima

<120> cDNA FOR HUMAN METHYLENETETRAHYDROFOLATE
REDUCTASE AND USES THEREOF

<130> 04844/005005

<150> US 09/592,595
<151> 2000-06-12

<150> US 09/258,928
<151> 1999-03-01

<150> US 08/738,000
<151> 1997-02-12

<150> PCT/CA95/00314
<151> 1995-05-25

<150> GB 9410620.0
<151> 1994-05-26

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<170> FastSEQ for Windows Version 4.0

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ccc tgc ttg gag ggc agt gcc agc agt ggc agt gag agc tcc aaa gat	96
Pro Cys Leu Glu Gly Ser Ala Ser Ser Gly Ser Glu Ser Ser Lys Asp	
20 25 30	
agt tcg aga tgt tcc acc ccg ggc ctg gac cct gag cg ^g cat gag aga	144
Ser Ser Arg Cys Ser Thr Pro Gly Leu Asp Pro Glu Arg His Glu Arg	
35 40 45	
ctc cgg gag aag atg agg cgg cga ttg gaa tct ggt gac aag tgg ttc	192
Leu Arg Glu Lys Met Arg Arg Leu Glu Ser Gly Asp Lys Trp Phe	
50 55 60	
tcc ctg gaa ttc ttc cct cct cga act gct gag gga gct gtc aat ctc	240
Ser Leu Glu Phe Phe Pro Pro Arg Thr Ala Glu Gly Ala Val Asn Leu	

65	70	75	80	
atc tca agg ttt gac cgg atg gca gca ggt ggc ccc ctc tac ata gac Ile Ser Arg Phe Asp Arg Met Ala Ala Gly Gly Pro Leu Tyr Ile Asp				288
85	90		95	
gtg acc tgg cac cca gca ggt gac cct ggc tca gac aag gag acc tcc Val Thr Trp His Pro Ala Gly Asp Pro Gly Ser Asp Lys Glu Thr Ser				336
100	105		110	
tcc atg atg atc gcc agc acc gcc gtg aac tac tgt ggc ctg gag acc Ser Met Met Ile Ala Ser Thr Ala Val Asn Tyr Cys Gly Leu Glu Thr				384
115	120		125	
atc ctg cac atg acc tgc tgc cgt cag cgc ctg gag gag atc acg ggc Ile Leu His Met Thr Cys Cys Arg Gln Arg Leu Glu Glu Ile Thr Gly				432
130	135		140	
cat ctg cac aaa gct aag cag ctg ggc ctg aag aac atc atg gcg ctg His Leu His Lys Ala Lys Gln Leu Gly Leu Lys Asn Ile Met Ala Leu				480
145	150		155	
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cgg gga gac cca ata ggt gac cag tgg gaa gag gag gag gga ggc ttc Arg Gly Asp Pro Ile Gly Asp Gln Trp Glu Glu Glu Gly Gly Phe				528
165	170		175	
aac tac gca gtg gac ctg gtg aag cac atc cga agt gag ttt ggt gac Asn Tyr Ala Val Asp Leu Val Lys His Ile Arg Ser Glu Phe Gly Asp				576
180	185		190	
tac ttt gac atc tgt gtg gca ggt tac ccc aaa ggc cac ccc gaa gca Tyr Phe Asp Ile Cys Val Ala Gly Tyr Pro Lys Gly His Pro Glu Ala				624
195	200		205	
gga ggc ttt gag gct gac ctg aag cac ttg aag gag aag gtc tct gcg Gly Ser Phe Glu Ala Asp Leu Lys His Leu Lys Glu Lys Val Ser Ala				672
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225	230		235	
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ttc cgc ttt gtg aag gca tgc acc gac atg ggc atc act tgc ccc atc Phe Arg Phe Val Lys Ala Cys Thr Asp Met Gly Ile Thr Cys Pro Ile				768
245	250		255	
gtc ccc ggg atc ttt ccc atc cag ggc tac cac tcc ctt cgg cag ctt Val Pro Gly Ile Phe Pro Ile Gln Gly Tyr His Ser Leu Arg Gln Leu				816
260	265		270	
gtg aag ctg tcc aag ctg gag gtg cca cag gag atc aag gac gtc att Val Lys Leu Ser Lys Leu Glu Val Pro Gln Glu Ile Lys Asp Val Ile				864
275	280		285	
gag cca atc aaa gac aac gat gct gcc atc cgc aac tat ggc atc gag Glu Pro Ile Lys Asp Asn Asp Ala Ala Ile Arg Asn Tyr Gly Ile Glu				912
290	295		300	
ctg gcc gtg agc ctg tgc cag gag ctt ctg gcc agt ggc ttg gtg cca				960

Leu Ala Val Ser Leu Cys Gln Glu Leu Leu Ala Ser Gly Leu Val Pro			
305	310	315	320
ggc ctc cac ttc tac acc ctc aac cgc gag atg gct acc aca gag gtg			1008
Gly Leu His Phe Tyr Thr Leu Asn Arg Glu Met Ala Thr Thr Glu Val			
325	330	335	
ctg aag cgc ctg ggg atg tgg act gag gac ccc agg cgt ccc cta ccc			1056
Leu Lys Arg Leu Gly Met Trp Thr Glu Asp Pro Arg Arg Pro Leu Pro			
340	345	350	
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Trp Ala Leu Ser Ala His Pro Lys Arg Arg Glu Glu Asp Val Arg Pro			
355	360	365	
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Ile Phe Trp Ala Ser Arg Pro Lys Ser Tyr Ile Tyr Arg Thr Gln Glu			
370	375	380	
tgg gac gag ttc cct aac ggc cgc tgg ggc aat tcc tct tcc cct gcc			1200
Trp Asp Glu Phe Pro Asn Gly Arg Trp Gly Asn Ser Ser Ser Pro Ala			
385	390	395	400
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Phe Gly Glu Leu Lys Asp Tyr Tyr Leu Phe Tyr Leu Lys Ser Lys Ser			
405	410	415	
ccc aag gag gag ctg ctg aag atg tgg ggg gag gag ctg acc agt gaa			1296
Pro Lys Glu Leu Leu Lys Met Trp Gly Glu Glu Leu Thr Ser Glu			
420	425	430	
gca agt gtc ttt gaa gtc ttt gtt ctt tac ctc tcg gga gaa cca aac			1344
Ala Ser Val Phe Glu Val Phe Val Leu Tyr Leu Ser Gly Glu Pro Asn			
435	440	445	
cgg aat ggt cac aaa gtg act tgc ctg ccc tgg aac gat gag ccc ctg			1392
Arg Asn Gly His Lys Val Thr Cys Leu Pro Trp Asn Asp Glu Pro Leu			
450	455	460	
gcg gct gag acc agc ctg ctg aag gag gag ctg ctg cgg gtg aac cgc			1440
Ala Ala Glu Thr Ser Leu Leu Lys Glu Leu Leu Arg Val Asn Arg			
465	470	475	480
cag ggc atc ctc acc atc aac tca cag ccc aac atc aac ggg aag ccg			1488
Gln Gly Ile Leu Thr Ile Asn Ser Gln Pro Asn Ile Asn Gly Lys Pro			
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tcc tcc gac ccc atc gtg ggc tgg ggc ccc agc ggg ggc tat gtc ttc			1536
Ser Ser Asp Pro Ile Val Gly Trp Gly Pro Ser Gly Gly Tyr Val Phe			
500	505	510	
cag aag gcc tac tta gag ttt ttc act tcc cgc gag aca gcg gaa gca			1584
Gln Lys Ala Tyr Leu Glu Phe Phe Thr Ser Arg Glu Thr Ala Glu Ala			
515	520	525	
ctt ctg caa gtg ctg aag aag tac gag ctc cgg gtt aat tac cac ctt			1632
Leu Leu Gln Val Leu Lys Lys Tyr Glu Leu Arg Val Asn Tyr His Leu			
530	535	540	

gtc aat gtg aag ggt gaa aac atc acc aat gcc cct gaa ctg cag ccg Val Asn Val Lys Gly Glu Asn Ile Thr Asn Ala Pro Glu Leu Gln Pro 545 550 555 560	1680
aat gct gtc act tgg ggc atc ttc cct ggg cga gag atc atc cag ccc Asn Ala Val Thr Trp Gly Ile Phe Pro Gly Arg Glu Ile Ile Gln Pro 565 570 575	1728
acc gta gtg gat ccc gtc agc ttc atg ttc tgg aag gac gag gcc ttt Thr Val Val Asp Pro Val Ser Phe Met Phe Trp Lys Asp Glu Ala Phe 580 585 590	1776
gcc ctg tgg att gag cgg tgg gga aag ctg tat gag gag gag tcc ccg Ala Leu Trp Ile Glu Arg Trp Gly Lys Leu Tyr Glu Glu Ser Pro 595 600 605	1824
tcc cgc acc atc atc cag tac atc cac gac aac tac ttc ctg gtc aac Ser Arg Thr Ile Ile Gln Tyr Ile His Asp Asn Tyr Phe Leu Val Asn 610 615 620	1872
ctg gtg gac aat gac ttc cca ctg gac aac tgc ctc tgg cag gtg gtg Leu Val Asp Asn Asp Phe Pro Leu Asp Asn Cys Leu Trp Gln Val Val 625 630 635 640	1920
gaa gac aca ttg gag ctt ctc aac agg ccc acc cag aat gcg aga gaa Glu Asp Thr Leu Glu Leu Asn Arg Pro Thr Gln Asn Ala Arg Glu 645 650 655	1968
acg gag gct cca tgaccctgcg tcctgacgcc ctgcgttgaa gccactcctg Thr Glu Ala Pro 660	2020
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Ser Ser Arg Cys Ser Thr Pro Gly Leu Asp Pro Glu Arg His Glu Arg 35 40 45	
Leu Arg Glu Lys Met Arg Arg Leu Glu Ser Gly Asp Lys Trp Phe 50 55 60	
Ser Leu Glu Phe Phe Pro Pro Arg Thr Ala Glu Gly Ala Val Asn Leu 65 70 75 80	
Ile Ser Arg Phe Asp Arg Met Ala Ala Gly Gly Pro Leu Tyr Ile Asp 85 90 95	
Val Thr Trp His Pro Ala Gly Asp Pro Gly Ser Asp Lys Glu Thr Ser 100 105 110	
Ser Met Met Ile Ala Ser Thr Ala Val Asn Tyr Cys Gly Leu Glu Thr 115 120 125	

Ile Leu His Met Thr Cys Cys Arg Gln Arg Leu Glu Glu Ile Thr Gly
 130 135 140
 His Leu His Lys Ala Lys Gln Leu Gly Leu Lys Asn Ile Met Ala Leu
 145 150 155 160
 Arg Gly Asp Pro Ile Gly Asp Gln Trp Glu Glu Glu Gly Gly Phe
 165 170 175
 Asn Tyr Ala Val Asp Leu Val Lys His Ile Arg Ser Glu Phe Gly Asp
 180 185 190
 Tyr Phe Asp Ile Cys Val Ala Gly Tyr Pro Lys Gly His Pro Glu Ala
 195 200 205
 Gly Ser Phe Glu Ala Asp Leu Lys His Leu Lys Glu Lys Val Ser Ala
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 Gly Ala Asp Phe Ile Ile Thr Gln Leu Phe Phe Glu Ala Asp Thr Phe
 225 230 235 240
 Phe Arg Phe Val Lys Ala Cys Thr Asp Met Gly Ile Thr Cys Pro Ile
 245 250 255
 Val Pro Gly Ile Phe Pro Ile Gln Gly Tyr His Ser Leu Arg Gln Leu
 260 265 270
 Val Lys Leu Ser Lys Leu Glu Val Pro Gln Glu Ile Lys Asp Val Ile
 275 280 285
 Glu Pro Ile Lys Asp Asn Asp Ala Ala Ile Arg Asn Tyr Gly Ile Glu
 290 295 300
 Leu Ala Val Ser Leu Cys Gln Glu Leu Leu Ala Ser Gly Leu Val Pro
 305 310 315 320
 Gly Leu His Phe Tyr Thr Leu Asn Arg Glu Met Ala Thr Thr Glu Val
 325 330 335
 Leu Lys Arg Leu Gly Met Trp Thr Glu Asp Pro Arg Arg Pro Leu Pro
 340 345 350
 Trp Ala Leu Ser Ala His Pro Lys Arg Arg Glu Glu Asp Val Arg Pro
 355 360 365
 Ile Phe Trp Ala Ser Arg Pro Lys Ser Tyr Ile Tyr Arg Thr Gln Glu
 370 375 380
 Trp Asp Glu Phe Pro Asn Gly Arg Trp Gly Asn Ser Ser Ser Pro Ala
 385 390 395 400
 Phe Gly Glu Leu Lys Asp Tyr Tyr Leu Phe Tyr Leu Lys Ser Lys Ser
 405 410 415
 Pro Lys Glu Glu Leu Leu Lys Met Trp Gly Glu Glu Leu Thr Ser Glu
 420 425 430
 Ala Ser Val Phe Glu Val Phe Val Leu Tyr Leu Ser Gly Glu Pro Asn
 435 440 445
 Arg Asn Gly His Lys Val Thr Cys Leu Pro Trp Asn Asp Glu Pro Leu
 450 455 460
 Ala Ala Glu Thr Ser Leu Leu Lys Glu Glu Leu Leu Arg Val Asn Arg
 465 470 475 480
 Gln Gly Ile Leu Thr Ile Asn Ser Gln Pro Asn Ile Asn Gly Lys Pro
 485 490 495
 Ser Ser Asp Pro Ile Val Gly Trp Gly Pro Ser Gly Gly Tyr Val Phe
 500 505 510
 Gln Lys Ala Tyr Leu Glu Phe Phe Thr Ser Arg Glu Thr Ala Glu Ala
 515 520 525
 Leu Leu Gln Val Leu Lys Lys Tyr Glu Leu Arg Val Asn Tyr His Leu
 530 535 540
 Val Asn Val Lys Gly Glu Asn Ile Thr Asn Ala Pro Glu Leu Gln Pro
 545 550 555 560
 Asn Ala Val Thr Trp Gly Ile Phe Pro Gly Arg Glu Ile Ile Gln Pro
 565 570 575
 Thr Val Val Asp Pro Val Ser Phe Met Phe Trp Lys Asp Glu Ala Phe
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 Ala Leu Trp Ile Glu Arg Trp Gly Lys Leu Tyr Glu Glu Ser Pro

595	600	605
Ser Arg Thr Ile Ile Gln Tyr Ile His Asp Asn Tyr Phe Leu Val Asn		
610	615	620
Leu Val Asp Asn Asp Phe Pro Leu Asp Asn Cys Leu Trp Gln Val Val		
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645	650	655
Thr Glu Ala Pro		
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Cys Leu Glu Gly Ser Ala Ser Ser Gly Ser Glu Ser Ser Lys Asp Ser	
15 20 25	
tcg aga tgt tcc acc ccg ggc ctg gac cct gag cgg cat gag aga ctc	147
Ser Arg Cys Ser Thr Pro Gly Leu Asp Pro Glu Arg His Glu Arg Leu	
30 35 40 45	
cgg gag aag atg agg cgg cga ttg gaa tct ggt gac aag tgg ttc tcc	195
Arg Glu Lys Met Arg Arg Leu Glu Ser Gly Asp Lys Trp Phe Ser	
50 55 60	
ctg gaa ttc ttc cct cct cga act gct gag gga gct gtc aat ctc atc	243
Leu Glu Phe Pro Pro Arg Thr Ala Glu Gly Ala Val Asn Leu Ile	
65 70 75	
tca agg ttt gac cgg atg gca gca ggt ggc ccc ctc tac ata gac gtg	291
Ser Arg Phe Asp Arg Met Ala Ala Gly Gly Pro Leu Tyr Ile Asp Val	
80 85 90	
acc tgg cac cca gca ggt gac cct ggc tca gac aag gag acc tcc tcc	339
Thr Trp His Pro Ala Gly Asp Pro Gly Ser Asp Lys Glu Thr Ser Ser	
95 100 105	
atg atg atc gcc agc acc gcc gtg aac tac tgt ggc ctg gag acc atc	387
Met Met Ile Ala Ser Thr Ala Val Asn Tyr Cys Gly Leu Glu Thr Ile	
110 115 120 125	
ctg cac atg acc tgc tgc cgt cag cgc ctg gag gag atc acg ggc cat	435
Leu His Met Thr Cys Cys Arg Gln Arg Leu Glu Glu Ile Thr Gly His	
130 135 140	
ctg cac aaa gct aag cag ctg ggc ctg aag aac atc atg gcg ctg cgg	483
Leu His Ala Lys Gln Leu Gly Leu Lys Asn Ile Met Ala Leu Arg	

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tac gca gtg gac ctg gtg aag cac atc cga agt gag ttt ggt gac tac Tyr Ala Val Asp Leu Val Lys His Ile Arg Ser Glu Phe Gly Asp Tyr 175	180	185	579
ttt gac atc tgt gtg gca ggt tac ccc aaa ggc cac ccc gaa gca ggg Phe Asp Ile Cys Val Ala Gly Tyr Pro Lys Gly His Pro Glu Ala Gly 190	195	200	627
agc ttt gag gct gac ctg aag cac ttg aag gag aag gtg tct gcg gga Ser Phe Glu Ala Asp Leu Lys His Leu Lys Glu Lys Val Ser Ala Gly 210	215	220	675
gcc gat ttc atc atc acg cag ctt ttc ttt gag gct gac aca ttc ttc Ala Asp Phe Ile Ile Thr Gln Leu Phe Glu Ala Asp Thr Phe Phe 225	230	235	723
cgc ttt gtg aag gca tgc acc gac atg ggc atc act tgc ccc atc gtc Arg Phe Val Lys Ala Cys Thr Asp Met Gly Ile Thr Cys Pro Ile Val 240	245	250	771
ccc ggg atc ttt ccc atc cag ggc tac cac tcc ctt cg ^g cag ctt gtg Pro Gly Ile Phe Pro Ile Gln Gly Tyr His Ser Leu Arg Gln Leu Val 255	260	265	819
aag ctg tcc aag ctg gag gtg cca cag gag atc aag gac gtg att gag Lys Leu Ser Lys Leu Glu Val Pro Gln Glu Ile Lys Asp Val Ile Glu 270	275	280	867
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gcc gtg agc ctg tgc cag gag ctt ctg gcc agt ggc ttg gtg cca ggc Ala Val Ser Leu Cys Gln Glu Leu Leu Ala Ser Gly Leu Val Pro Gly 305	310	315	963
ctc cac ttc tac acc ctc aac cgc gag atg gct acc aca gag gtg ctg Leu His Phe Tyr Thr Leu Asn Arg Glu Met Ala Thr Thr Glu Val Leu 320	325	330	1011
aag cgc ctg ggg atg tgg act gag gac ccc agg cgt ccc cta ccc tgg Lys Arg Leu Gly Met Trp Thr Glu Asp Pro Arg Arg Pro Leu Pro Trp 335	340	345	1059
gct ctc agt gcc cac ccc aag cgc cga gag gaa gat gta cgt ccc atc Ala Leu Ser Ala His Pro Lys Arg Arg Glu Glu Asp Val Arg Pro Ile 350	355	360	1107
ttc tgg gcc tcc aga cca aag agt tac atc tac cgt acc cag gag tgg Phe Trp Ala Ser Arg Pro Lys Ser Tyr Ile Tyr Arg Thr Gln Glu Trp 370	375	380	1155
gac gag ttc cct aac ggc cgc tgg ggc aat tcc tct tcc cct gcc ttt			1203

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Gly Glu Leu Lys Asp Tyr Tyr Leu Phe Tyr Leu Lys Ser Lys Ser Pro			
400	405	410	
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Lys Glu Glu Leu Leu Lys Met Trp Gly Glu Glu Leu Thr Ser Glu Ala			
415	420	425	
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Ser Val Phe Glu Val Phe Val Leu Tyr Leu Ser Gly Glu Pro Asn Arg			
430	435	440	445
aat ggt cac aaa gtg act tgc ctg ccc tgg aac gat gag ccc ctg gcg			1395
Asn Gly His Lys Val Thr Cys Leu Pro Trp Asn Asp Glu Pro Leu Ala			
450	455	460	
gct gag acc agc ctg ctg aag gag gag ctg ctg cgg gtg aac cgc cag			1443
Ala Glu Thr Ser Leu Leu Lys Glu Glu Leu Leu Arg Val Asn Arg Gln			
465	470	475	
ggc atc ctc acc atc aac tca cag ccc aac atc aac ggg aag ccg tcc			1491
Gly Ile Leu Thr Ile Asn Ser Gln Pro Asn Ile Asn Gly Lys Pro Ser			
480	485	490	
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Ser Asp Pro Ile Val Gly Trp Gly Pro Ser Gly Gly Tyr Val Phe Gln			
495	500	505	
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Lys Ala Tyr Leu Glu Phe Phe Thr Ser Arg Glu Thr Ala Glu Ala Leu			
510	515	520	525
ctg caa gtg ctg aag aag tac gag ctc cgg gtt aat tac cac ctt gtc			1635
Leu Gln Val Leu Lys Tyr Glu Leu Arg Val Asn Tyr His Leu Val			
530	535	540	
aat gtg aag ggt gaa aac atc acc aat gcc cct gaa ctg cag ccg aat			1683
Asn Val Lys Gly Glu Asn Ile Thr Asn Ala Pro Glu Leu Gln Pro Asn			
545	550	555	
gct gtc act tgg ggc atc ttc cct ggg cga gag atc atc cag ccc acc			1731
Ala Val Thr Trp Gly Ile Phe Pro Gly Arg Glu Ile Ile Gln Pro Thr			
560	565	570	
gta gtg gat ccc gtc agc ttc atg ttc tgg aag gac gag gac ttt gcc			1779
Val Val Asp Pro Val Ser Phe Met Phe Trp Lys Asp Glu Ala Phe Ala			
575	580	585	
ctg tgg att gag cgg tgg gga aag ctg tat gag gag gag tcc ccg tcc			1827
Leu Trp Ile Glu Arg Trp Gly Lys Leu Tyr Glu Glu Glu Ser Pro Ser			
590	595	600	605
cgc acc atc atc cag tac atc cac gac aac tac ttc ctg gtc aac ctg			1875
Arg Thr Ile Ile Gln Tyr Ile His Asp Asn Tyr Phe Leu Val Asn Leu			
610	615	620	

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gag gct cca tga ccctgcgtcc tgacgccctg cgttggagcc actcctgtcc Glu Ala Pro * 655	2023
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Ser Thr Pro Gly Leu Asp Pro Glu Arg His Glu Arg Leu Arg Glu Lys 35 40 45	
Met Arg Arg Arg Leu Glu Ser Gly Asp Lys Trp Phe Ser Leu Glu Phe 50 55 60	
Phe Pro Pro Arg Thr Ala Glu Gly Ala Val Asn Leu Ile Ser Arg Phe 65 70 75 80	
Asp Arg Met Ala Ala Gly Gly Pro Leu Tyr Ile Asp Val Thr Trp His 85 90 95	
Pro Ala Gly Asp Pro Gly Ser Asp Lys Glu Thr Ser Ser Met Met Ile 100 105 110	
Ala Ser Thr Ala Val Asn Tyr Cys Gly Leu Glu Thr Ile Leu His Met 115 120 125	
Thr Cys Cys Arg Gln Arg Leu Glu Glu Ile Thr Gly His Leu His Lys 130 135 140	
Ala Lys Gln Leu Gly Leu Lys Asn Ile Met Ala Leu Arg Gly Asp Pro 145 150 155 160	
Ile Gly Asp Gln Trp Glu Glu Glu Gly Gly Phe Asn Tyr Ala Val 165 170 175	
Asp Leu Val Lys His Ile Arg Ser Glu Phe Gly Asp Tyr Phe Asp Ile 180 185 190	
Cys Val Ala Gly Tyr Pro Lys Gly His Pro Glu Ala Gly Ser Phe Glu 195 200 205	
Ala Asp Leu Lys His Leu Lys Glu Lys Val Ser Ala Gly Ala Asp Phe 210 215 220	
Ile Ile Thr Gln Leu Phe Phe Glu Ala Asp Thr Phe Phe Arg Phe Val 225 230 235 240	
Lys Ala Cys Thr Asp Met Gly Ile Thr Cys Pro Ile Val Pro Gly Ile 245 250 255	
Phe Pro Ile Gln Gly Tyr His Ser Leu Arg Gln Leu Val Lys Leu Ser 260 265 270	
Lys Leu Glu Val Pro Gln Glu Ile Lys Asp Val Ile Glu Pro Ile Lys 275 280 285	

Asp Asn Asp Ala Ala Ile Arg Asn Tyr Gly Ile Glu Leu Ala Val Ser
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 Leu Cys Gln Glu Leu Leu Ala Ser Gly Leu Val Pro Gly Leu His Phe
 305 310 315 320
 Tyr Thr Leu Asn Arg Glu Met Ala Thr Thr Glu Val Leu Lys Arg Leu
 325 330 335
 Gly Met Trp Thr Glu Asp Pro Arg Arg Pro Leu Pro Trp Ala Leu Ser
 340 345 350
 Ala His Pro Lys Arg Arg Glu Glu Asp Val Arg Pro Ile Phe Trp Ala
 355 360 365
 Ser Arg Pro Lys Ser Tyr Ile Tyr Arg Thr Gln Glu Trp Asp Glu Phe
 370 375 380
 Pro Asn Gly Arg Trp Gly Asn Ser Ser Pro Ala Phe Gly Glu Leu
 385 390 395 400
 Lys Asp Tyr Tyr Leu Phe Tyr Leu Lys Ser Lys Ser Pro Lys Glu Glu
 405 410 415
 Leu Leu Lys Met Trp Gly Glu Glu Leu Thr Ser Glu Ala Ser Val Phe
 420 425 430
 Glu Val Phe Val Leu Tyr Leu Ser Gly Glu Pro Asn Arg Asn Gly His
 435 440 445
 Lys Val Thr Cys Leu Pro Trp Asn Asp Glu Pro Leu Ala Ala Glu Thr
 450 455 460
 Ser Leu Leu Lys Glu Glu Leu Leu Arg Val Asn Arg Gln Gly Ile Leu
 465 470 475 480
 Thr Ile Asn Ser Gln Pro Asn Ile Asn Gly Lys Pro Ser Ser Asp Pro
 485 490 495
 Ile Val Gly Trp Gly Pro Ser Gly Gly Tyr Val Phe Gln Lys Ala Tyr
 500 505 510
 Leu Glu Phe Phe Thr Ser Arg Glu Thr Ala Glu Ala Leu Leu Gln Val
 515 520 525
 Leu Lys Lys Tyr Glu Leu Arg Val Asn Tyr His Leu Val Asn Val Lys
 530 535 540
 Gly Glu Asn Ile Thr Asn Ala Pro Glu Leu Gln Pro Asn Ala Val Thr
 545 550 555 560
 Trp Gly Ile Phe Pro Gly Arg Glu Ile Ile Gln Pro Thr Val Val Asp
 565 570 575
 Pro Val Ser Phe Met Phe Trp Lys Asp Glu Ala Phe Ala Leu Trp Ile
 580 585 590
 Glu Arg Trp Gly Lys Leu Tyr Glu Glu Glu Ser Pro Ser Arg Thr Ile
 595 600 605
 Ile Gln Tyr Ile His Asp Asn Tyr Phe Leu Val Asn Leu Val Asp Asn
 610 615 620
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